

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 2

Dkt: 303.706US1

IN THE CLAIMS

1. (Original) An integrated circuit package comprising:
- a substrate;
 - a die; and
 - a material having a Young's modulus of between about .1 megapascals and about 20 megapascals, at a solder reflow temperature, attaching the die to the substrate.
2. (Original) The integrated circuit package of claim 1, wherein the substrate comprises a ceramic.
3. (Original) The integrated circuit package of claim 1, wherein the die comprises one or more memory circuits.
4. (Original) The integrated circuit package of claim 1, wherein the die comprises one or more processor circuits.
5. (Original) The integrated circuit package of claim 1, wherein the die comprises one or more logic circuits.
6. (Original) The integrated circuit package of claim 1 wherein the die comprises one or more application specific integrated circuits.
7. (Original) The integrated circuit package of claim 1, wherein the material comprises a poly epoxide formed from one epoxide.
8. (Original) The integrated circuit package of claim 1, wherein the material comprises a poly epoxide formed from two or more epoxides.

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 3

Dkt: 303.706US1

9. (Original) The integrated circuit package of claim 1, wherein the material comprises a polyacrylate.

10. (Original) The integrated circuit package of claim 1, wherein the material comprises a polyolefin.

11. (Original) The integrated circuit package of claim 1, wherein the material comprises a polyimide.

12. (Original) The integrated circuit package of claim 1, wherein the material comprises a mixture of at least two of a poly epoxide, polyacrylate, polyimide, and polyolefin.

13. (Original) The integrated circuit package of claim 1, wherein the material comprises a copolymer of at least two of a poly epoxide, a polyacrylate, polyimide, and polyolefin.

14. (Original) The integrated circuit package of claim 1, wherein the material comprises a mixture of a poly epoxide and a polyimide.

15. (Original) The integrated circuit package of claim 1, wherein the material comprises a copolymer of a poly epoxide and a polyimide.

16. (Original) The integrated circuit package of claim 1, wherein the material has a Shore A hardness of greater than about 70.

17. (Original) The integrated circuit package of claim 1, wherein the material has a Shore D hardness of greater than about 20.

18. (Previously amended) An integrated circuit package comprising:
a substrate;

Cont
D1

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 4

Dkt: 303.706US1

a die; and

a material having a coefficient of thermal expansion α_2 of less than about 400 (four-hundred) ppm/ $^{\circ}$ C attaching the die to the substrate, wherein the material has a Young's modulus of between .1 megapascals and about 20 megapascals, at a solder reflow temperature.

19. (Original) The integrated circuit package of claim 18, wherein the substrate comprises a single metal layer glass-epoxide.

20. (Original) The integrated circuit package of claim 18, wherein the die comprises one or more processor circuits.

21. (Original) The integrated circuit package of claim 18 wherein the die comprises one or more memory circuits.

22. (Original) The integrated circuit package of claim 18, wherein the die comprises one or more logic circuits.

23. (Original) The integrated circuit package of claim 18, wherein the die comprises one or more application specific integrated circuits.

24. (Original) The integrated circuit package of claim 18, wherein the material comprises a poly epoxide formed from one epoxide.

25. (Original) The integrated circuit package of claim 18, wherein the material comprises a poly epoxide formed from two or more epoxides.

26. (Original) The integrated circuit package of claim 18, wherein the material comprises a polyacrylate.

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 5

Dkt: 303.706US1

27. (Original) The integrated circuit package of claim 18, wherein the material comprises a polyolefin.

28. (Original) The integrated circuit package of claim 18, wherein the material comprises a polyimide.

29. (Original) The integrated circuit package of claim 18, wherein the material comprises a mixture of at least two of a poly epoxide, polyacrylate, polyimide, and polyolefin.

30. (Original) The integrated circuit package of claim 18, wherein the material comprises a copolymer of at least two of a poly epoxide, a polyacrylate, polyimide, and polyolefin.

31. (Original) The integrated circuit package of claim 18, wherein the material comprises a mixture of a poly epoxide and a polyimide.

32. (Original) The integrated circuit package of claim 18, wherein the material comprises a copolymer of a poly epoxide and a polyimide.

33. (Original) The integrated circuit package of claim 18, wherein the material has a Shore A hardness of greater than about 70.

34. (Original) The integrated circuit package of claim 18, wherein the material has a Shore D hardness of greater than about 20.

35. (Original) An integrated circuit package comprising:

a substrate;

a die; and

a rigid die attach material attaching the die to the substrate.

cont.
D

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 6

Dkt: 303.706US1

36. (Original) The integrated circuit package of claim 35, wherein the substrate comprises a printed circuit board.

37. (Original) The integrated circuit package of claim 35, wherein the die comprises a communication circuit.

38. (Original) The integrated circuit package of claim 35, wherein the die comprises one or more memory circuits.

39. (Original) The integrated circuit package of claim 35, wherein the die comprises one or more processor circuits.

40. (Original) The integrated circuit package of claim 35, wherein the die comprises one or more logic circuits.

41. (Original) The integrated circuit package of claim 35, wherein the die comprises one or more application specific integrated circuits.

42. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a poly epoxide formed from one epoxide.

43. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a poly epoxide formed from two or more epoxides.

44. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a polyacrylate.

45. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a polyolefin.

cont
D

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 7

Dkt: 303.706US1

46. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a polyimide.

47. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a mixture of at least two of a poly epoxide, polyacrylate, polyimide, and polyolefin.

48. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a copolymer of at least two of a poly epoxide, a polyacrylate, polyimide, and polyolefin.

49. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a mixture of a poly epoxide and a polyimide.

50. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material comprises a copolymer of a poly epoxide and a polyimide.

51. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material has a Shore A hardness of greater than about 70.

52. (Original) The integrated circuit package of claim 35, wherein the rigid die attach material has a Shore D hardness of greater than about 20.

53. - 107. (Previously Withdrawn)

108. (Original) An integrated circuit package comprising:

a ceramic substrate;

a die; and

a material having a Young's modulus of between about .1 and about 20, at a solder reflow temperature, attaching the die to the substrate.

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 8

Dkt: 303.706US1

109. (Original) The integrated circuit package of claim 108, wherein the ceramic substrate comprises a multi-metal layer ceramic substrate.

110. (Original) The integrated circuit package of claim 108, wherein the die comprises a communication circuit fabricated on a semiconductor.

111. (Original) The integrated circuit package of claim 108, wherein the die comprises one or more memory circuits.

112. (Original) The integrated circuit package of claim 108, wherein the die comprises one or more processor circuits.

113. (Original) The integrated circuit package of claim 108, wherein the die comprises one or more logic circuits.

114. (Original) The integrated circuit package of claim 108, wherein the die comprises one or more application specific integrated circuits.

115. (Original) The integrated circuit package of claim 108, wherein the material comprises one or more epoxides, poly epoxides, copolymers of epoxides, or mixtures thereof.

116. (Original) The integrated circuit package of claim 108, wherein the material comprises a poly epoxide formed from one epoxide.

117. (Original) The integrated circuit package of claim 108, wherein the material comprises a poly epoxide formed from two or more epoxides.

118. (Original) The integrated circuit package of claim 108, wherein the material comprises a polyacrylate.

cont
D

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 9

Dkt: 303.706US1

119. (Original) The integrated circuit package of claim 108, wherein the material comprises a polyolefin.

120. (Original) The integrated circuit package of claim 108, wherein the material comprises a polyimide.

121. (Original) The integrated circuit package of claim 108, wherein the material comprises a mixture of at least two of a poly epoxide, polyacrylate, polyimide, and polyolefin.

122. (Original) The integrated circuit package of claim 108, wherein the material comprises a copolymer of at least two of a poly epoxide, a polyacrylate, polyimide, and polyolefin.

123. (Original) The integrated circuit package of claim 108, wherein the material comprises a mixture of a poly epoxide and a polyimide.

124. (Original) The integrated circuit package of claim 108, wherein the material comprises a copolymer of a poly epoxide and a polyimide.

125. (Original) The integrated circuit package of claim 108, wherein the material has a Shore A hardness of greater than about 70.

126. (Original) The integrated circuit package of claim 108, wherein the material has a Shore D hardness of greater than about 20.

127. - 135. (Previously Canceled)

cont.
D,

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 10

Dkt: 303.706US1

136. (Original) An integrated circuit package comprising:

a ceramic substrate;

a die; and

a rigid die attach material attaching the die to the substrate.

137. (Original) The integrated circuit package of claim 136, wherein the ceramic substrate comprises a multilayered ceramic substrate.

138. (Original) The integrated circuit package of claim 136, wherein the die comprises germanium.

139. (Original) The integrated circuit package of claim 136, wherein the die comprises one or more memory circuits.

140. (Original) The integrated circuit package of claim 136, wherein the die comprises one or more processor circuits.

141. (Original) The integrated circuit package of claim 136, wherein the die comprises one or more logic circuits.

142. (Original) The integrated circuit package of claim 136, wherein the die comprises one or more application specific integrated circuits.

143. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises one or more epoxides, poly epoxides, copolymers of epoxides, or mixtures thereof.

144. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a poly epoxide formed from one epoxide.

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 11

Dkt: 303.706US1

145. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a poly epoxide formed from two or more epoxides.

146. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a polyacrylate.

147. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a polyolefin.

148. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a polyimide.

149. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a mixture of at least two of a poly epoxide, polyacrylate, polyimide, and polyolefin.

150. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a copolymer of at least two of a poly epoxide, a polyacrylate, polyimide, and polyolefin.

151. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a mixture of a poly epoxide and a polyimide.

152. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material comprises a copolymer of a poly epoxide and a polyimide.

153. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material has a Shore A hardness of greater than about 70.

Cont
D1

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 12

Dkt: 303.706US1

154. (Original) The integrated circuit package of claim 136, wherein the rigid die attach material has a Shore D hardness of greater than about 20.

155. - 251. (Previously Withdrawn)

252. (Previously amended) An integrated circuit package comprising:

a substrate;

a die; and

a material having a coefficient of thermal expansion α_2 of between about one and about sixty-two ppm/ $^{\circ}$ C attaching the die to the substrate, wherein the material has a Young's modulus of between .1 megapascals and about 20 megapascals, at a solder reflow temperature.

253. (Previously added) The integrated circuit package of claim 252, wherein the substrate comprises a single metal layer glass-epoxide.

254. (Previously added) The integrated circuit package of claim 252, wherein the die comprises one or more processor circuits.

255. (Previously added) The integrated circuit package of claim 252 wherein the die comprises one or more memory circuits.

256. (Previously added) The integrated circuit package of claim 252, wherein the die comprises one or more logic circuits.

257. (Previously added) The integrated circuit package of claim 252, wherein the die comprises one or more application specific integrated circuits.

258. (Previously added) The integrated circuit package of claim 252, wherein the material comprises a poly epoxide formed from one epoxide.

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 13

Dkt: 303.706US1

259. (Previously added) The integrated circuit package of claim 252, wherein the material comprises a poly epoxide formed from two or more epoxides.

260. (Previously added) The integrated circuit package of claim 252, wherein the material comprises a polyacrylate.

261. (Currently amended) An integrated circuit package comprising:
a substrate;
a die; and
a material having a coefficient of thermal expansion α_2 of between about 151 (one-hundred and fifty-one) and about 400 (four-hundred)} ppm/°C attaching the die to the substrate, wherein the material has a Young's modulus of between .1 megapascals and about 20 megapascals, at a solder reflow temperature.

262. (Previously added) The integrated circuit package of claim 261, wherein the material comprises a polyolefin.

263. (Previously added) The integrated circuit package of claim 261, wherein the material comprises a polyimide.

264. (Previously added) The integrated circuit package of claim 261, wherein the material comprises a mixture of at least two of a poly epoxide, polyacrylate, polyimide, and polyolefin.

265. (Previously added) The integrated circuit package of claim 261, wherein the material comprises a copolymer of at least two of a poly epoxide, a polyacrylate, polyimide, and polyolefin.

266. (Previously added) The integrated circuit package of claim 261, wherein the material comprises a mixture of a poly epoxide and a polyimide.

cont
D1

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 14

Dkt: 303.706US1

267. (Previously added) The integrated circuit package of claim 261, wherein the material comprises a copolymer of a poly epoxide and a polyimide.

268. (Previously added) The integrated circuit package of claim 261, wherein the material has a Shore A hardness of greater than about 70.

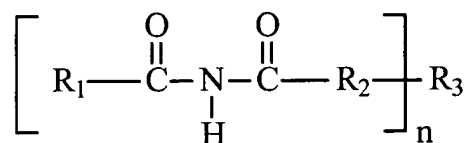
269. (Previously added) The integrated circuit package of claim 261, wherein the material has a Shore D hardness of greater than about 20.

270. (New) An integrated circuit package comprising:

a substrate;

a die;

a polyimide material having a Young's modulus of between .1 megapascals and about 20 megapascals, at a solder reflow temperature, to attaching the die to the substrate, wherein the polyimide material is a compound of formula:



271. (New) The integrated circuit package of claim 270, wherein n is in a range of two to 1000.

272. (New) The integrated circuit package of claim 270, wherein R₁ is (C₁-C₂₄)alkenyl.

273. (New) The integrated circuit package of claim 270, wherein R₂ is (C₂-C₂₄)alkenyl.

273. (New) The integrated circuit package of claim 270, wherein R₃ is (C₁-C₂₄)alkenyl.

AMENDMENT

Serial Number: 09/775,366

Filing Date: February 1, 2001

Title: ELECTRONIC DEVICE PACKAGE

Page 15

Dkt: 303.706US1

*Cont
Rule
12c D1*
274

271. (New) The integrated circuit package of claim 270, wherein the substrate comprises a ceramic.

275

272. (New) The integrated circuit package of claim 270, wherein the die comprises one or more memory circuits.
